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Migration of parabolic dunes at Aberffraw on the island of Anglesey, north Wales

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Aberffraw is a 1km wide and 3km long transgressive dune field that extends inland along a northeast – southwest trending valley from a southwest facing beach, Traeth Mawr. The prevailing wind is from the southwest and both the parabolic dunes and the valley within which they lie are parallel to the prevailing wind.

The dune field at Aberffraw includes two foredune ridges and three rows of active compound parabolic dunes. At the landward end is a lake, Llyn Coron, which has been formed by dunes migrating up the valley and damming the river, Afon Ffraw. Between the parabolic dunes are gently sloping interdune areas with a close cropped vegetation. The parabolic dunes at Aberffraw have been migrating inland across the interdunes areas. Rates of parabolic dune migration are derived from three sets of aerial photographs taken in 1940, 1982 and 1993. The aerial photographs have been scanned and manipulated in ArcView GIS software. Registration of the aerial photographs to an Ordnance Survey map was performed using ground control points (GCPs), common fixed features which are identifiable on both the aerial photographs and the baseline map (e.g. road intersections, road corners, buildings). Attempts to correct for the inherent distortions of aerial photography (sensor and panoramic distortion) are made during registration. Standardising the projection of the photographs to a common baseline allows meaningful spatial analysis, and the dune ridges, trailing edges, and areas of bare sand were mapped from each photograph as a series of overlays.

Rates of dune ridge migration are calculated from the spatial distance between linear trend lines applied to sections of dune ridges for 1940 and 1993. Trend lines were only fitted to sections where continuity of dune form was maintained over the given time period. Rates of parabolic dune migration range from a minimum 0 m/yr to a maximum of 2.63 m/yr, with an average migration rate of 1.1 m/yr.

At the same time, the foredune ridge has been accreting and prograded 60 m onto the beach. The rate of foreslope accretion is approximately 1.09 m/yr. The volume of sand accumulated in the foredune ridge between 1940 and 1993 is estimated at 475,000m^3, a sediment accumulation rate of approximately 20,000 Tonnes/yr.